Uncertainty of LW Fluxes Due to Scene Identification

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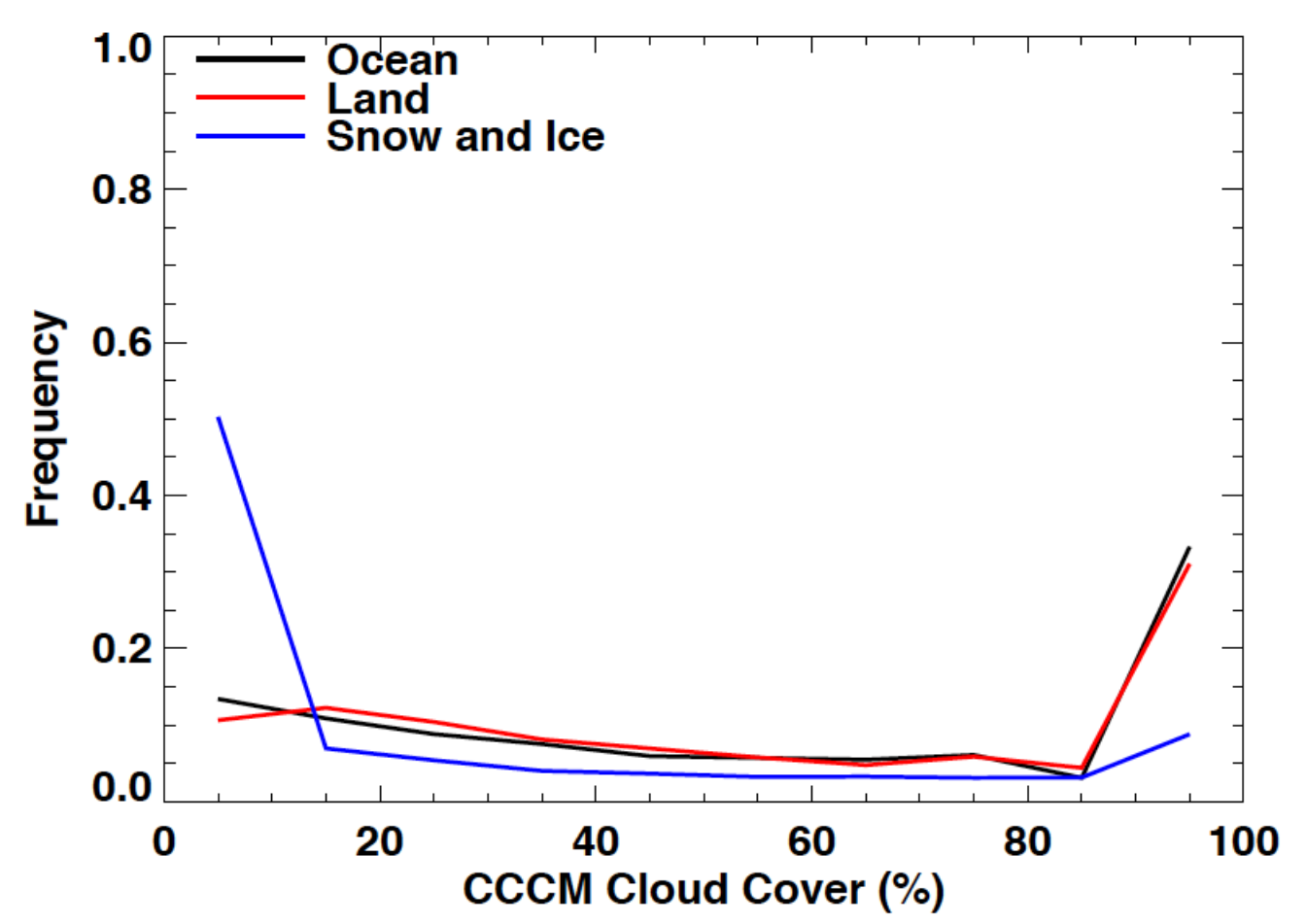
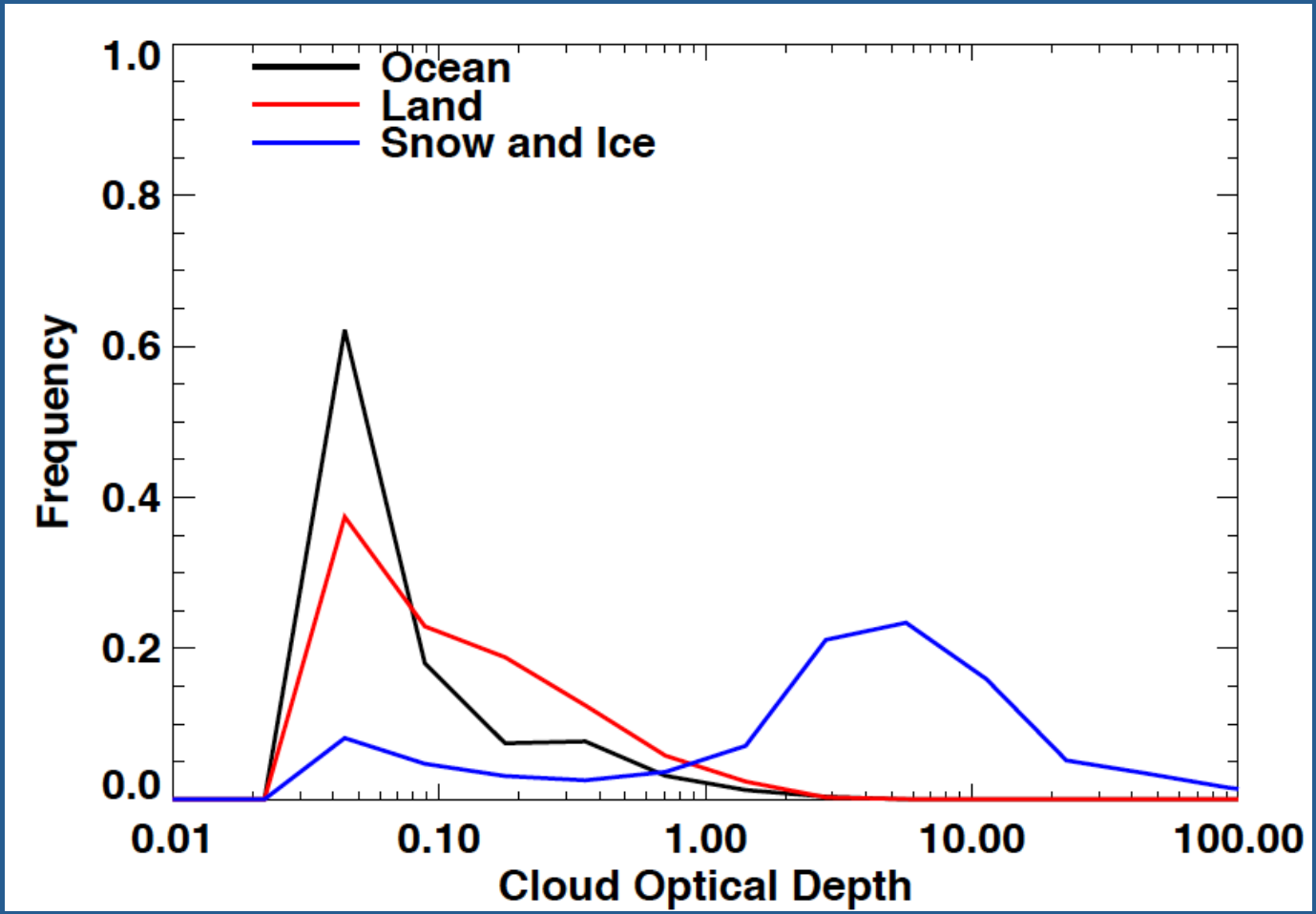
Introduction

- We are interested in knowing what clouds the CERES-MODIS retrievals miss, and what the effects of including these clouds are on LW fluxes.
- To estimate this, we use the ground-track CERES-MODIS cloud and surface properties in the CCCM SSF product, and the corresponding “enhanced” properties that use CALIPSO and CloudSat cloud mask and height.
- The LW flux inversion code is then run twice. Once with the CERES-MODIS ground-track cloud properties, and once with the enhanced cloud properties.

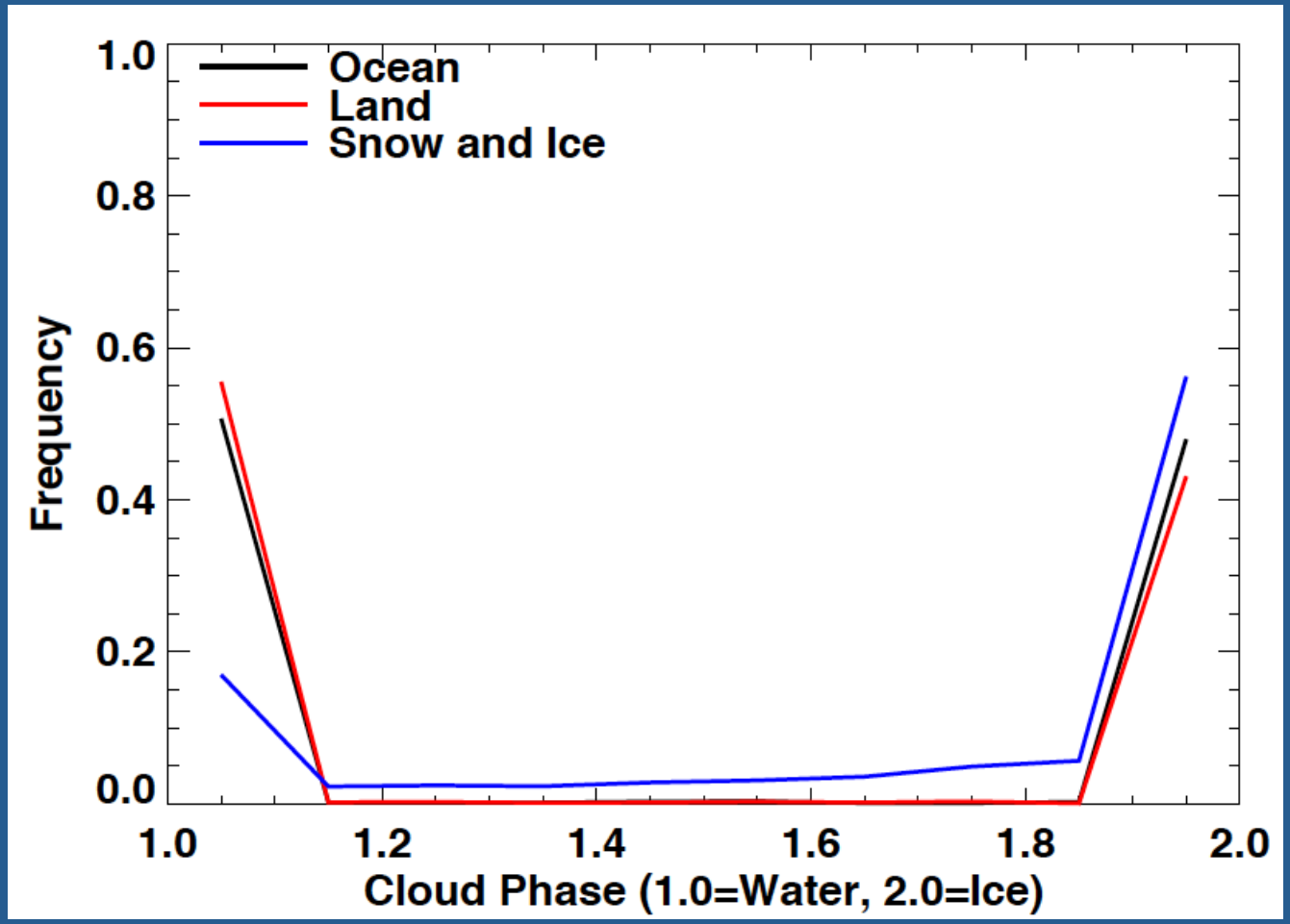
January 2010, Daytime, CERES-MODIS Clear, C3M Cloudy



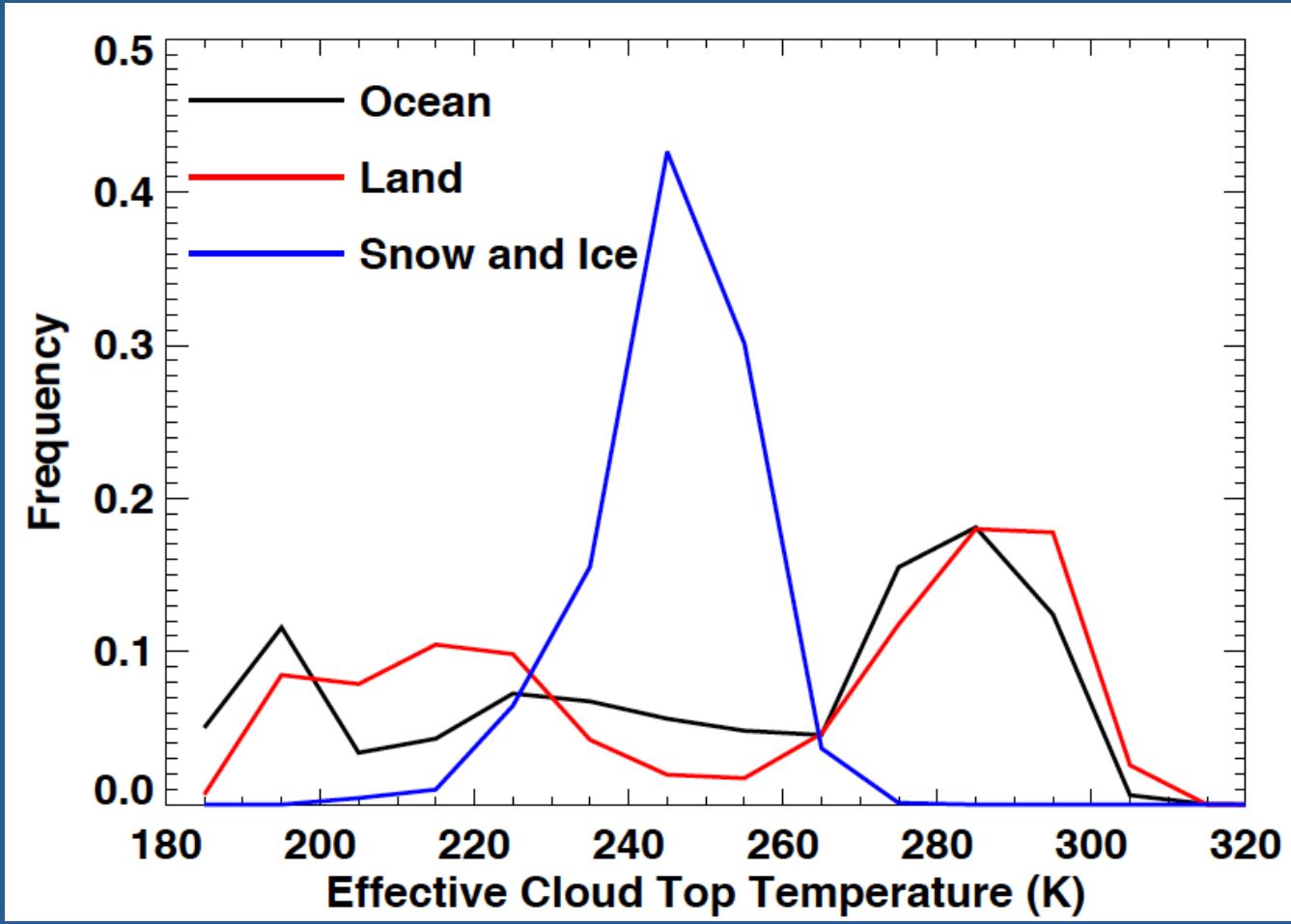
January 2010, Daytime, CERES-MODIS Clear, C3M Cloudy



January 2010, Daytime, CERES-MODIS Clear, C3M Cloudy



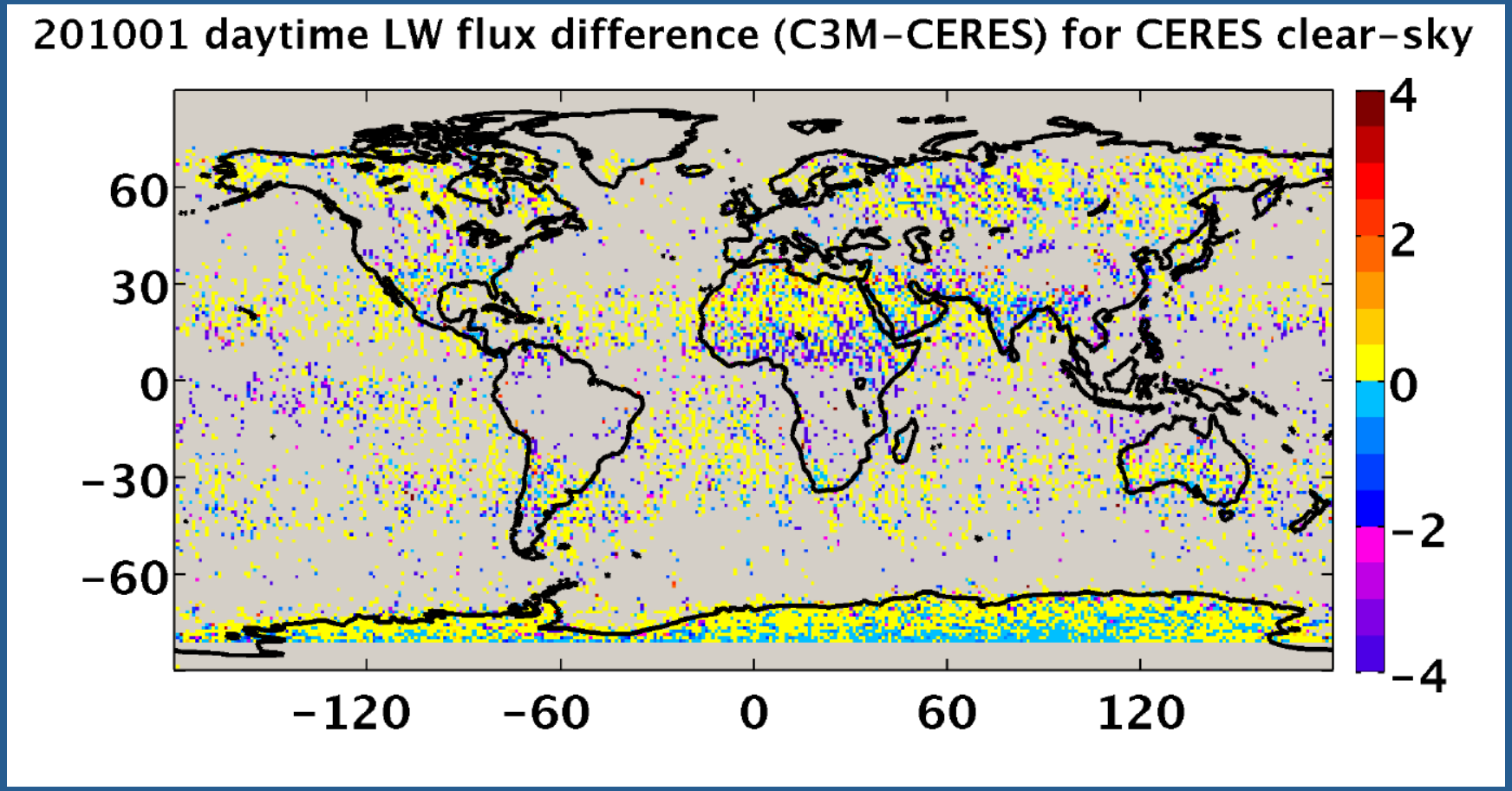
January 2010, Daytime, CERES-MODIS Clear, C3M Cloudy



C3M Update – CERES-MODIS Clear sky, Daytime Jan 2010

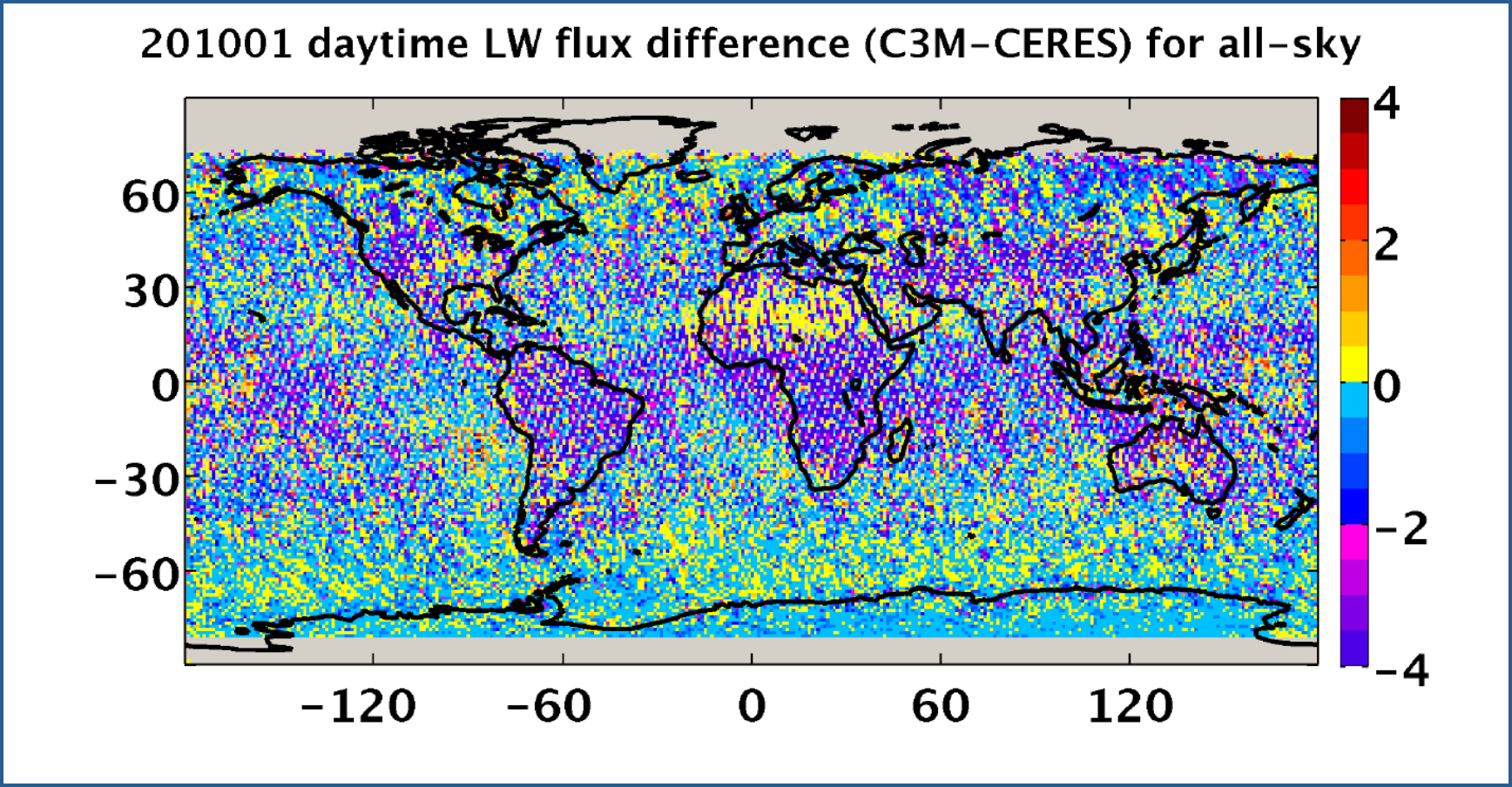
Class	Cloud fraction diff	LW flux diff
Calipso-Cloudsat All-sky, Retrieval OK (Ocean)	12.9%	-0.7 W m^{-2}
Calipso-Cloudsat Cloudy, Retrieval OK (Ocean)	56.5%	-3.2 W m^{-2}
Calipso-Cloudsat All-sky, Retrieval OK (Land)	13.9%	-1.8 W m^{-2}
Calipso-Cloudsat Cloudy, Retrieval OK (Land)	56.0%	-7.2 W m^{-2}
Calipso-Cloudsat All-sky, Retrieval OK (Snow+Ice)	10.8%	-0.3 W m^{-2}
Calipso-Cloudsat Cloudy, Retrieval OK (Snow+Ice)	21.0%	-0.6 W m^{-2}

January 2010 Daytime CERES-MODIS Clear-sky Regional LW flux diffs (C3M-CERES-MODIS)



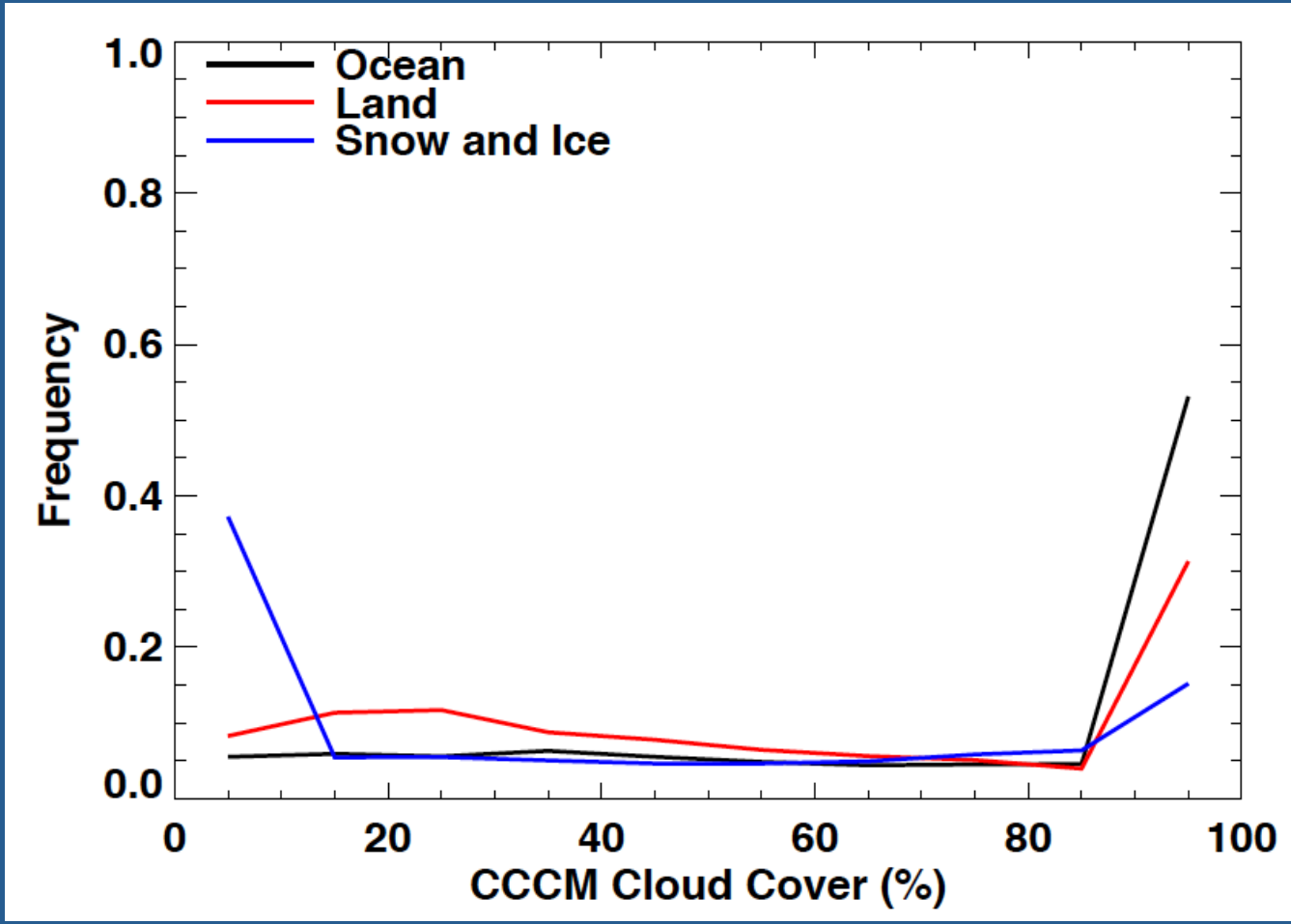
Avg = -1.2 W m^{-2}

January 2010 Daytime All-Sky Regional LW flux diffs (C3M-CERES-MODIS)

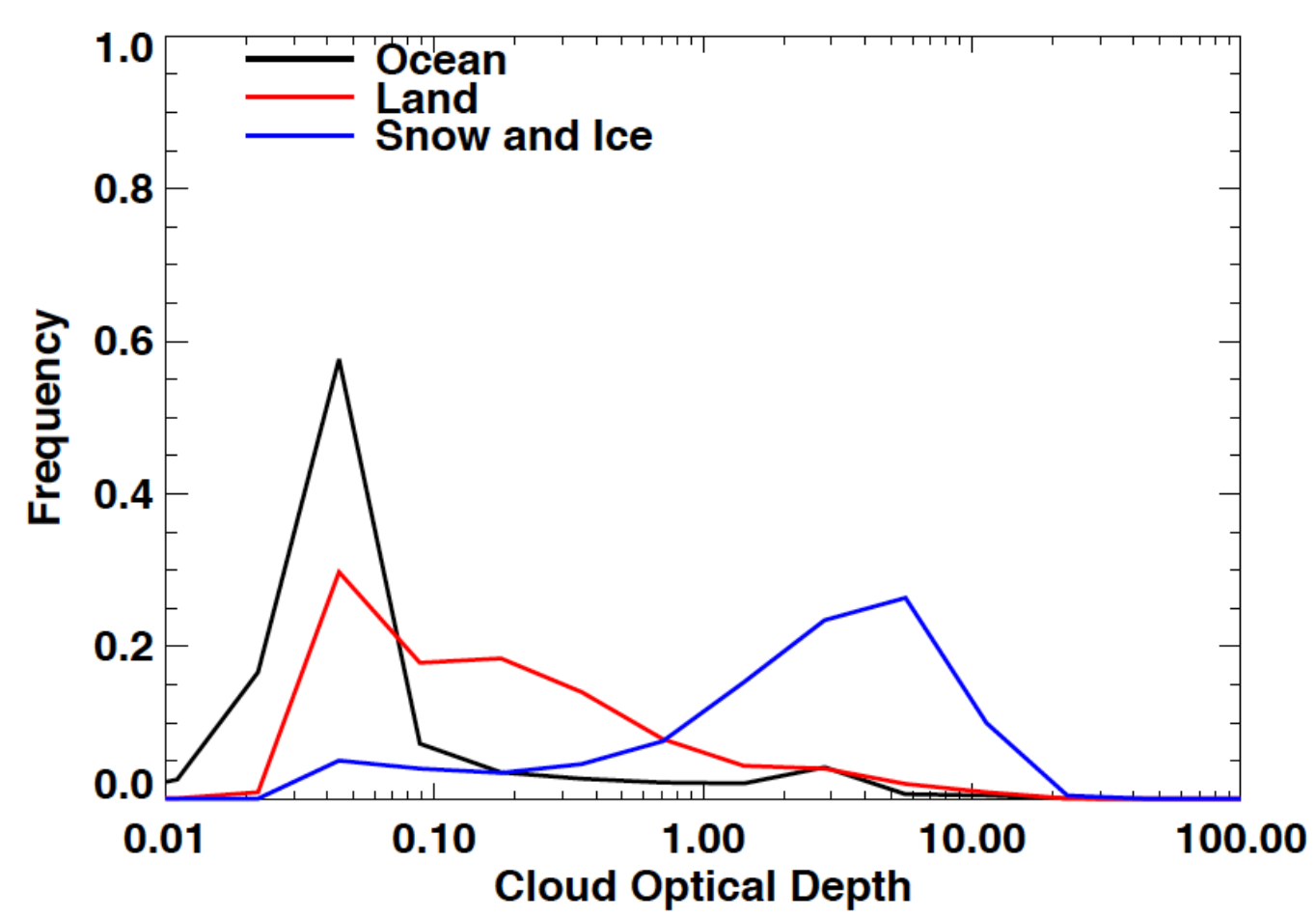


Avg = -1.1 W m^{-2}

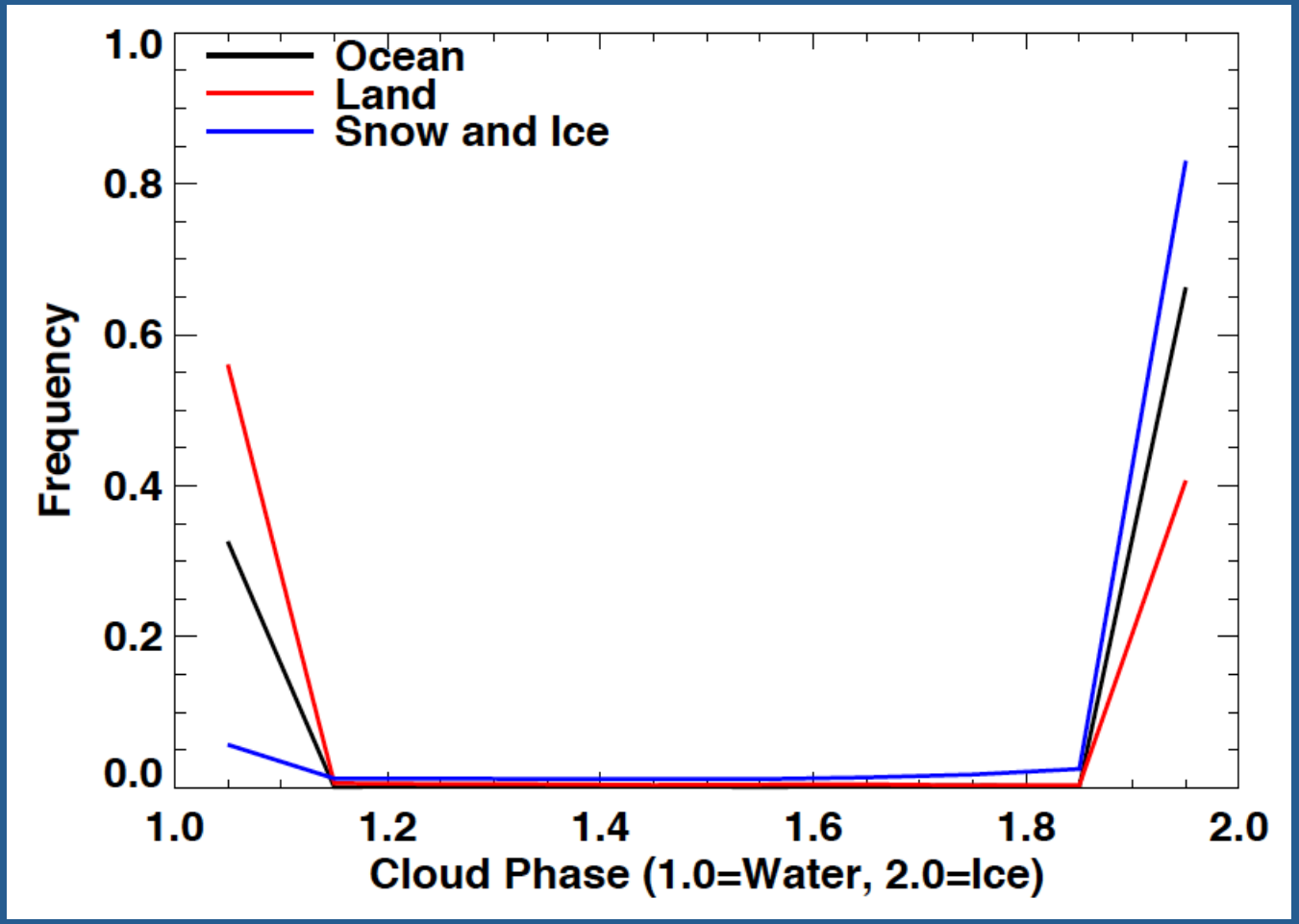
January 2010, Nighttime, CERES-MODIS Clear, C3M Cloudy



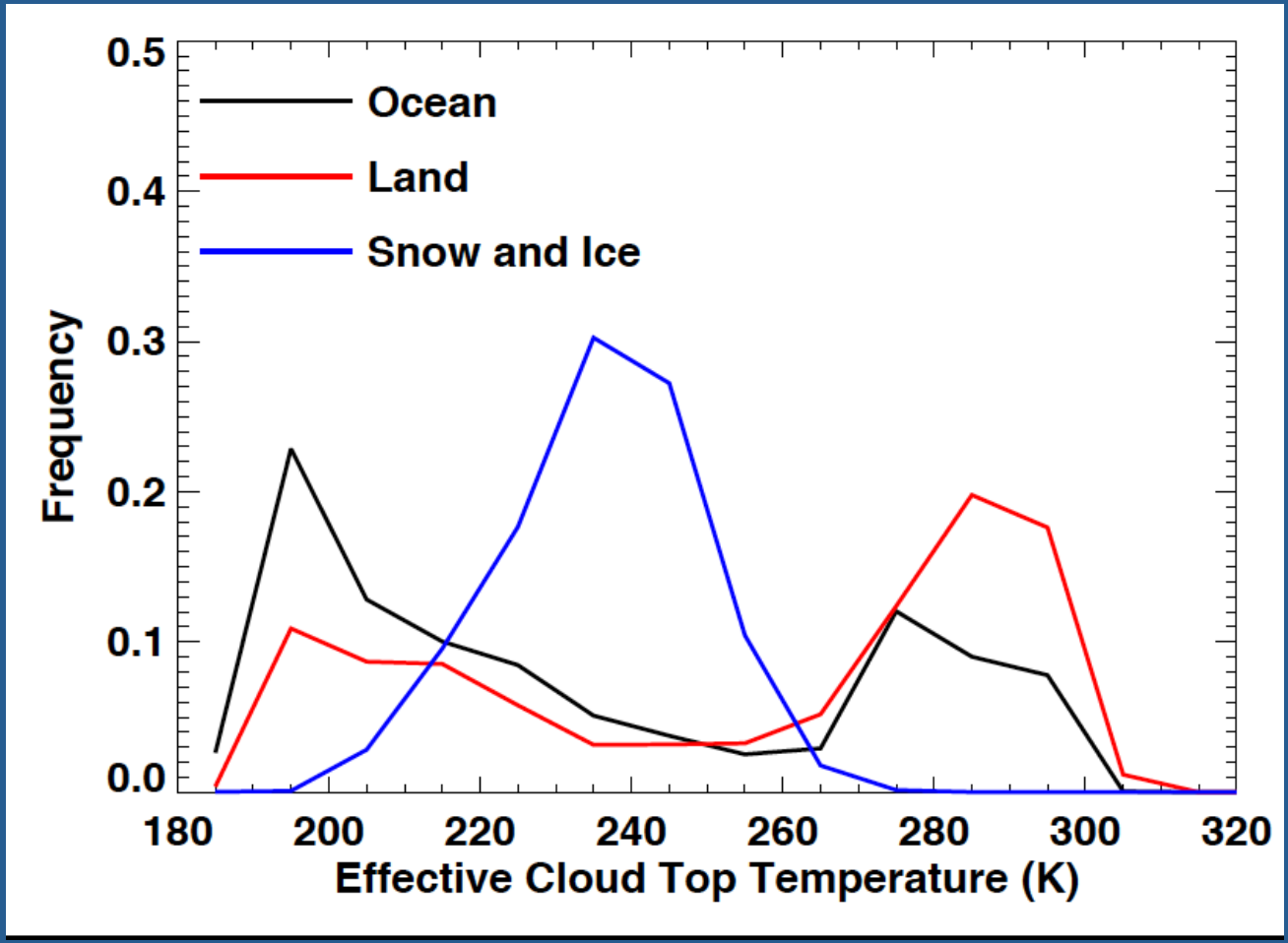
January 2010, Nighttime, CERES-MODIS Clear, C3M Cloudy



January 2010, Nighttime, CERES-MODIS Clear, C3M Cloudy



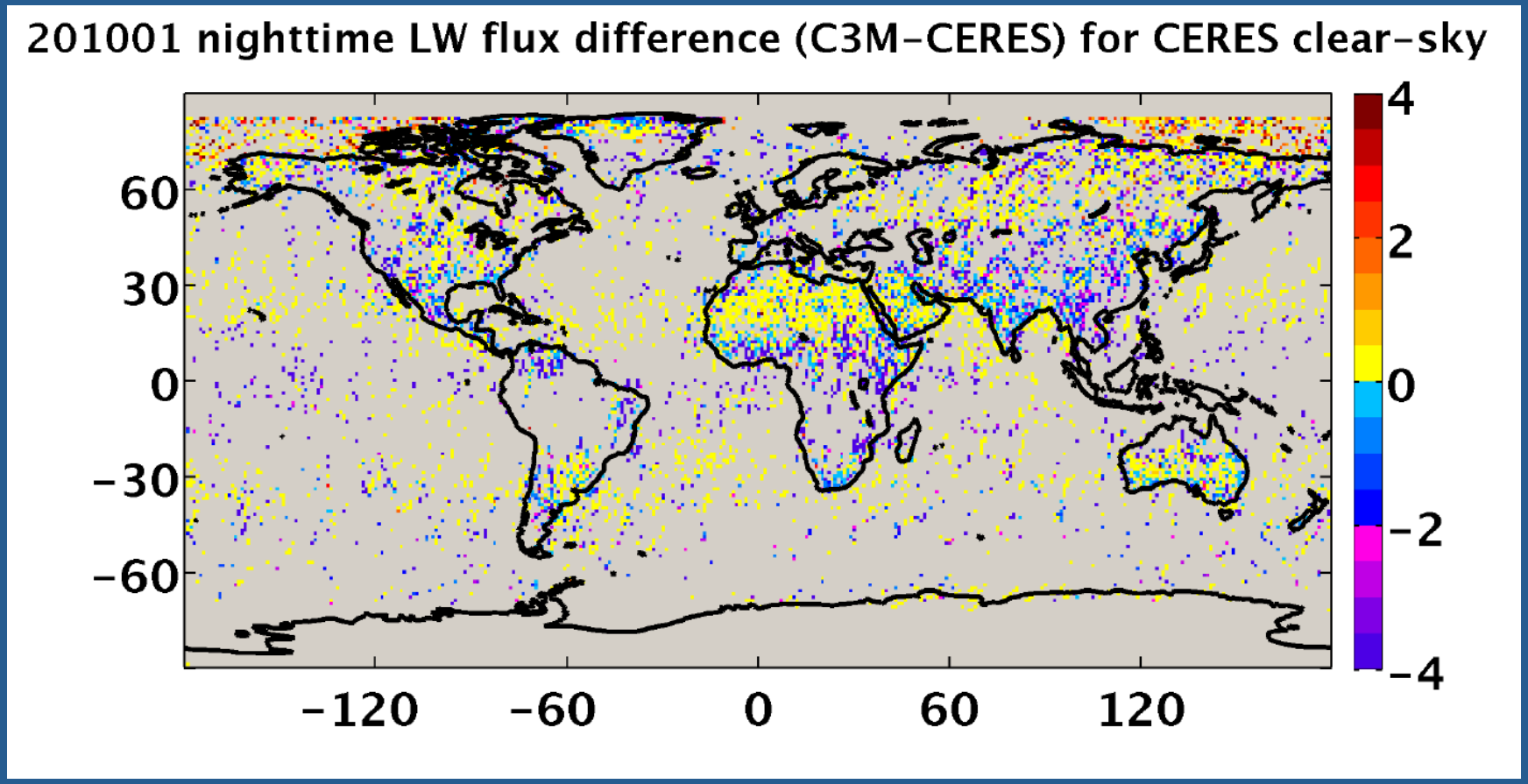
January 2010, Nighttime, CERES-MODIS Clear, C3M Cloudy



C3M Update – CERES-MODIS Clear sky, Nighttime Jan 2010

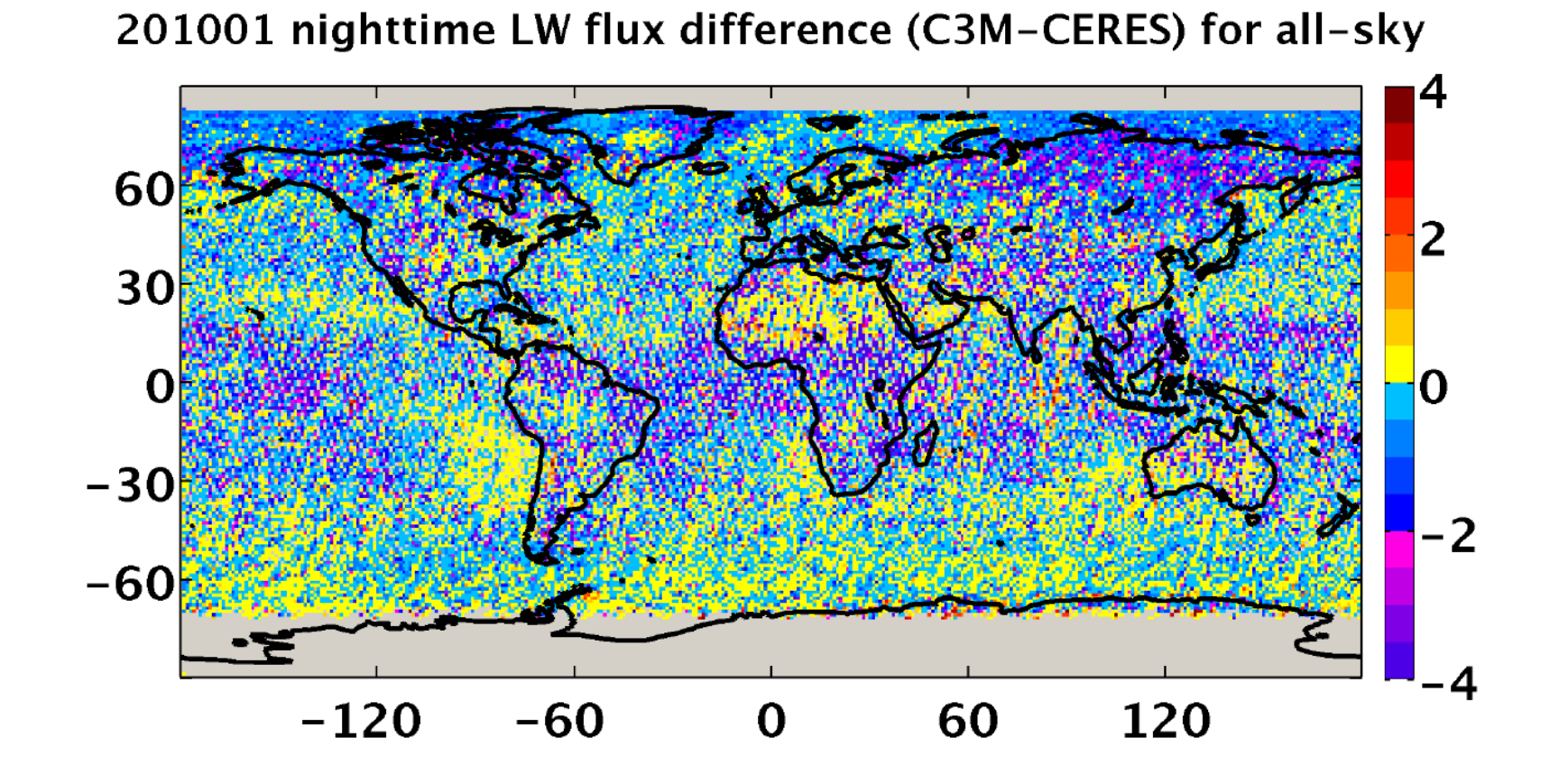
Class	Cloud fraction diff	LW flux diff
Calipso-Cloudsat All-sky, Retrieval OK (Ocean)	20.1%	-1.9 W m^{-2}
Calipso-Cloudsat Cloudy, Retrieval OK (Ocean)	72.9%	-6.7 W m^{-2}
Calipso-Cloudsat All-sky, Retrieval OK (Land)	20.1%	-2.0 W m^{-2}
Calipso-Cloudsat Cloudy, Retrieval OK (Land)	57.0%	-5.6 W m^{-2}
Calipso-Cloudsat All-sky, Retrieval OK (Snow+Ice)	24.7%	-0.7 W m^{-2}
Calipso-Cloudsat Cloudy, Retrieval OK (Snow+Ice)	35.0%	-1.0 W m^{-2}

January 2010 Nighttime CERES-MODIS Clear-sky Regional LW flux diffs (C3M-CERES-MODIS)



Avg = -2.1 W m^{-2}

January 2010 Nighttime All-sky Regional LW flux diffs (C3M-CERES-MODIS)



Avg = -0.8 W m^{-2}

Summary

- The clouds that are missed by CERES-MODIS tend to be optically thin over land and ocean surfaces, but thicker over snow and ice surfaces.
- For clear CERES-MODIS scenes, the LW fluxes with C3M clouds are 1.2 (daytime) and 2.1 W m^{-2} (nighttime) lower than those with CERES-MODIS clouds.
- For all-sky CERES-MODIS scenes, the LW fluxes with C3M clouds are 1.1 (daytime) and 0.8 W m^{-2} (nighttime) lower than those with CERES-MODIS clouds.
- In the future, we will examine the effects on SW fluxes.